# APPENDIX A
# APPLICATION AND TAILORING OF SECTION 4

## A.1 SCOPE

### A.1.1 Scope.

This appendix provides guidance and criteria for (a) the procuring activity's selection and use of this handbook for contract reference and, when used, (b) the tailoring of program task guidelines in Section 4.

### A.1.2 Purpose.

The purpose of this appendix is to limit program tasks to minimum essential needs. Stating such minimum essential needs in the solicitation gives the offeror a basis for providing information on the proposed HE program. This appendix also provides users of the handbook with guidance regarding applicability of the program task guidelines and, as a result, the sections covering HE procedures, methods, and tools.

## A.2 APPLICABLE DOCUMENTS

### A.2.1 General.

The documents listed below are not necessarily all the documents referenced herein, but are the ones needed to fully understand the information provided by this appendix.

### A.2.2 Government documents.

A.2.2.1 Specifications, standards, and handbooks. The following standard and handbook form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the latest issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplements thereto.

HANDBOOK

DEPARTMENT OF DEFENSE

MIL-HDBK-280 - Definitions of Item Levels, Item Inter-changeability, Models, and Related Terms

MIL-HDBK-1908 - Definitions of Human Factors Terms

(Unless otherwise indicated, copies of Federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

A.2.2.2 Other Government documents, drawings, and publications. The following document forms a part of this appendix to the extent specified:

AD-1410 - Aeronautical Data Design for Maintainer Program Requirements

(Application for copies should be addressed to Commander, Naval Air Systems Command, Code AIR 4.6, Patuxent River, MD 20670.)

## A.3 DEFINITIONS

Terms are defined in accordance with MIL-HDBK-1908.

## A.4 APPLICATION OF SECTION 4, PROGRAM TASKS

### A.4.1 General.

Selection of Section 4 for citation in solicitations depends on the nature of the materiel in terms of operational and mission maintenance and support functions, the degree to which human interface is involved with materiel, including software, and the acquisition phase involved. Selection of Section 4 is generally independent of system complexity, branch of military service involved, equipment duty cycles, and, within practical limits, contract type, cost, and duration, and size of production lots.

### A.4.2 Selection for use.

The procuring activity should first decide whether to cite MIL-HDBK-46855 in the solicitation by considering the following provisions, as shown in the selection process guide of Figure A-1.

A.4.2.1 Nature of the materiel. Selection of MIL-HDBK-46855 for a specific contract is dependent upon the nature of the end item, materiel, or system in terms of its ability to perform operational and mission maintenance and support functions. Generally, the guide

- should not be considered for use in contracts for parts, subassemblies, or units as defined in MIL-STD-280,
- should be considered for use in contracts for sets, subsystems, and systems, as defined in MIL-STD-280, and for facilities.

The rationale for this initial screening is that parts, subassemblies, assemblies, and units typically are not produced to perform an operational function, but can be used as elements of different sets, subsystems, etc., that perform different desired operational functions. The contractor furnishing such items (e.g., transformers, wheel bearings, amplifiers) has no control over the diverse uses to

which they will be applied or knowledge of the human performance requirements implicit in such uses. Accordingly, it is not generally reasonable to invoke MIL-HDBK-46855 for parts, subassemblies, assemblies, or units.

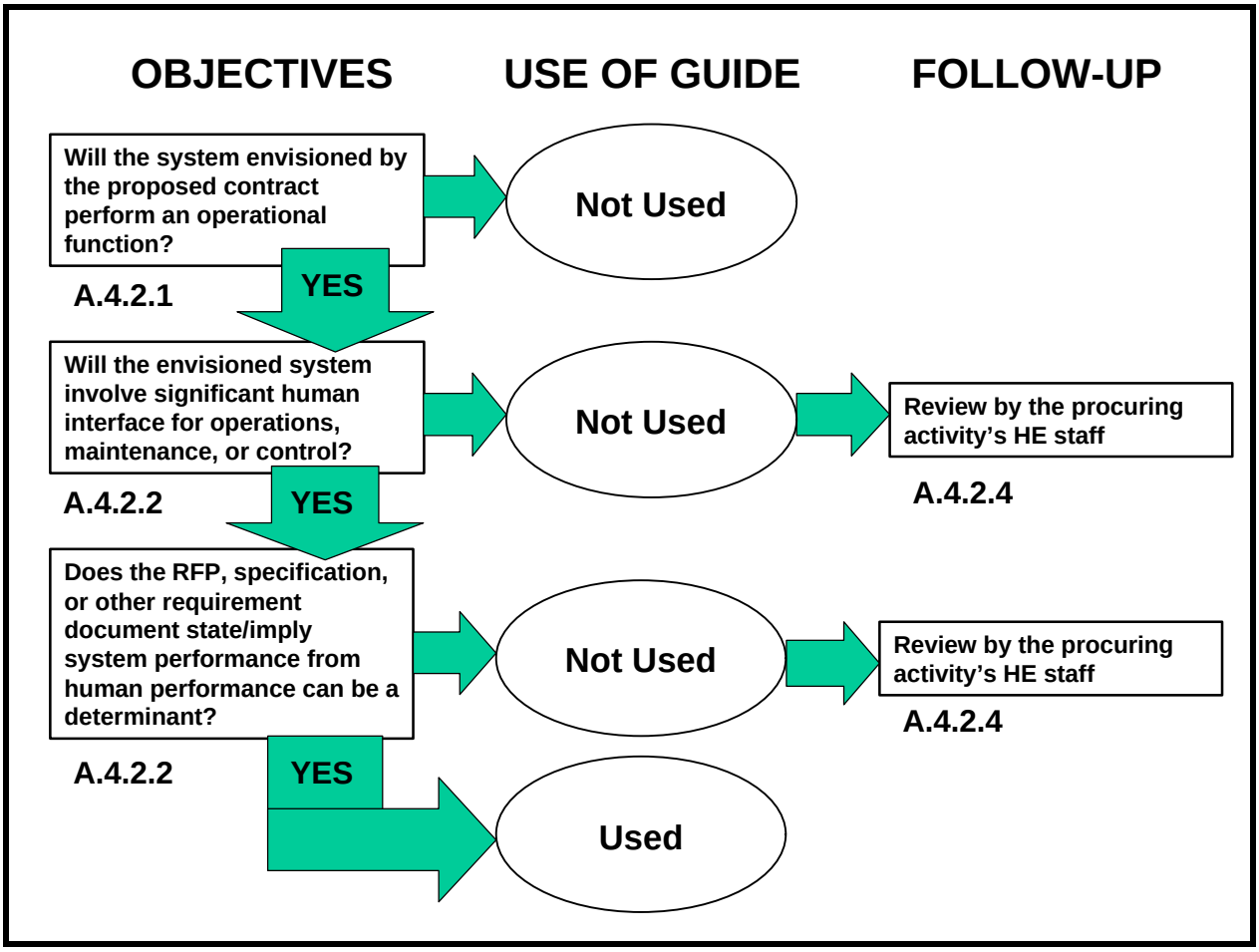


FIGURE A-1. Selection process guide.

A.4.2.2 Extent of human interface involved. Selection of MIL-HDBK-46855 for reference in a specific contract is sensitive to the extent of human involvement or interface for operation, maintenance, control, transport, or shelter. Generally, the handbook should not be considered for use in contracts for materiel where human involvement or interface is not anticipated or is obviously insignificant.

A.4.2.3 Nature of stated performance requirements. If, for a specific solicitation, MIL-HDBK-46855 has survived the tests of A4.2.1 and A4.2.2, its selection should be based on stated or implied performance requirements. If the solicitation, specification, or other requirement document states or implies performance requirements or goals, such as time and error, for which human performance can reasonably be considered a determinant or contributor, MIL-HDBK-46855 should be cited in the solicitation.

A.4.2.4 Selection review. At this point, citation of the handbook has been tentatively determined. If the procuring activity's HE practitioners (human factors, human factors engineering, Human Systems Integration [HSI], crew systems integration, or equivalent personnel) have not already been involved in this decision-making process, they should be consulted to ensure that MIL-HDBK-46855 is not erroneously cited or rejected. Should results of this review disclose that the handbook should not be used, the process is complete; however, if results of this review conclude that the handbook should be cited, the tailoring process of A.5 should be pursued. The offeror may further tailor the guidelines.

## A.5 TAILORING SECTION 4, PROGRAM TASKS.

### A.5.1 General.

The primary purpose of HE program tasks and, therefore, Section 4, is to influence the design of the system, equipment, and facility—not to generate documentation. Accordingly, with the exception of validation efforts, tasks or documents that do not contribute to design or that emerge after design cannot be changed should be avoided because they are wasteful and drain resources from accomplishment of needed effort. Every HE task must focus on influencing design and testing, consistent with the nature of the procurement and the acquisition phase involved.

### A.5.2 Tailoring.

Table A-I provides guidance to facilitate the tailoring of Section 4 of this handbook. The sections covering procedures and techniques need not be tailored, since their applicability is driven by Section 4. Use of the tailoring matrix should be consistent with the following explanations and guidelines.

### A.5.3 Contractual applicability.

A.5.3.1 Contractor use. Unless otherwise specified by the procuring activity, contractors should use the tailored version of Section 4 (and therefore other applicable sections of this handbook) as a baseline for preparing solicitation responses and HE program planning information. Further tailoring by offerors is expected.

A.5.3.2 Evolutionary development. For evolutionary development of older or existing systems, equipment, software, and facilities, Section 4 should generally apply only to new designs and procedures involving human interfaces and to old designs, procedures, and interfaces that may be impacted thereby. When old systems undergo improvement through evolutionary means, the guide should generally not be applied to components that are retained and are not affected by such evolutionary development techniques. It is important to understand that there may be exceptions to this general rule; therefore, evaluation by the HE staff is considered extremely advisable.

TABLE A-I. Tailoring guidelines.

| PARAGRAPH NUMBER | MODIFICATION |
|---|---|
| 4.1.1.1 Analysis | Phase I: Delete the first three sentences. Change the fourth sentence to: "Each task that must be performed to accomplish allocated functions should be analyzed to determine the human...." In the last line, change "design" to "validation."<br><br>Phase II: Same as for Phase I above. |
| 4.1.1.2 Design and development | Phase 0: Revise the title to "Preliminary design and development." Insert "Preliminary" at the beginning of the first sentence. In the fourth line, change "detail" to "preliminary." |
| 4.1.2 HE program planning | Phase 0: In lines 1-2, change "equipment specification" to "mission need."<br><br>Phase I: In lines 1-2, change "equipment specification" to "overall program objectives." |
| 4.1.6.1 Traceability | Phase 0: In lines 3-4, delete from "design and development" to the end of the sentence and insert "concept submission."<br><br>Phase I: In line 2, insert "preliminary" after "through." In lines 3-4, delete from "the verification" to the end of the sentence and insert "validation and demonstration." |
| 4.2.1.1.2 Estimates of potential user processing capabilities | Phase 0: In sentence 5, delete "design." |
| 4.2.1.2 Equipment selection | Phase 0: In line 2, change "design requirements" to "concepts." In line 3, change "configuration" to "concept." |
| 4.2.1.3.5 Timeliness and availability | Phase 0: In line 2, change "design" to "conceptual."<br><br>Phase I: In line 2, change "design" to "validation." |
| 4.2.1.4 Preliminary system and subsystem design | Phase 0: In line 2, change "designs" to "concept documentation" and delete the rest of the sentence.<br><br>Phase I: In line 6, put a full stop after "MIL-STD-1472" and delete the rest of the sentence. |
| 4.2.2.3 Work environment, crew station, and facilities design | Phase 0: Delete the first two sentences. Delete "Design of" from the beginning of the third sentence and add "concepts" after "facilities." |
| 4.2.3 HE in test and evaluation | Phase I: In the first sentence, change (1) to read "demonstrate that human performance technical risks have been identified and that solutions are defined." |

| | |
|---|---|
| 4.2.3.1 Planning | Phase I: In the first sentence, change “into engineering design and development tests” to “into validation and demonstration test planning” and delete “contractor demonstrations, flight tests, acceptance tests.” |

Acquisition Phase 0: Concept Exploration
I: Program Definition & Risk Reduction
II: Engineering & Manufacturing Development
III: Production, Fielding/Deployment, & Operational Support

(See A.5.3.4 for tailoring guidelines)

A.5.3.3 Product improvement. Recognizing that product improvement actions may occur during more than one acquisition phase and that product improvements can involve concept exploration, program definition and risk reduction, or engineering and manufacturing development tasks, or a combination of these, the procuring activity should tailor applicable portions of Section 4 of this handbook to the specific performance objectives of the product improvement program.

A.5.3.4 Production, fielding/deployment, and operational support phase. Design changes affecting human performance during the production, fielding/deployment, and operational support phase can, like product improvement actions, involve concept exploration, program definition and risk reduction, or engineering and manufacturing development HE tasks. Therefore, the procuring activity should tailor applicable portions of the matrix to the specific performance objectives of the design changes. Particular attention should be directed toward failure analysis, quality assurance, drawing review, and software considerations.

A.5.3.5 Nondevelopmental item (NDI). Where an NDI is being acquired, applicable provisions of Section 4 may be used to guide government in-house efforts (see 6.1). Paragraph 4.2.1.2 should be considered to ensure that MIL-STD-1472 or other applicable HE design criteria will be a part of the selection criteria for determining the suitability of the item; 4.2.3 and its subparagraphs should be considered, as applicable, to verify human-system integration. In addition, the nature of the NDI program will influence tailored, in-house use of the guide. Where an item requires minor modification to meet the requirements of the procuring activity, and where the modification is driven by human performance or will result in significant human performance effects, applicable analysis tasks of 4.2.1, 4.2.2, and their subparagraphs may be used for identifying and implementing the modification.

A.5.3.6 Application of AD-1410. For Naval aviation systems and equipment design for integration within Naval aircraft, design for maintainer analyses and data review processes comply with AD-1410, where applicable.

A.5.4 HE review.

Procuring activities are responsible for ensuring that the selected tailoring of Section 4 has been subjected to HE review for consistency of the tailored requirements with human performance requirements pursuant to the nature of the objectives of the contract.

# APPENDIX B
# TASK ANALYSIS

## B.1 SCOPE

### B.1.1 Purpose.

This appendix provides guidelines for performing a task inventory and task analysis as part of the development and acquisition of military systems, equipment, and facilities. These guidelines include the work to be performed by the contractor in conducting a task inventory and task analysis during all phases of system development. They are the basis for addressing task inventory and task analysis during equipment design, test and evaluation (T&E) preparation, training requirements preparation, manning and workload assessment, development of training and maintenance manuals, and preparation of other documentation and reports. Finally, this appendix describes the task analysis product that the contractor submits to the procuring activity if required by the contract.

### B.1.2 Applicability.

This appendix can be applied to all military systems, equipment, and facility acquisition programs, major modification programs, and applicable research and development projects through all phases of the development and acquisition cycle. This appendix is for use by both contractor and government activities performing a task inventory and task analysis on systems, equipment, and facilities to which this handbook applies. This appendix is intended for use by the procuring activity and users of the task inventory and task analysis results to define for the contractor the requirements and output.

### B.1.3 Tailoring the task inventory and task analysis.

The task inventory and task analysis guidelines contained herein may not all be applicable to every program or program phase. Accordingly, the government should tailor this appendix to specific programs and the milestone phase of the program within the overall life cycle. This tailoring should consist of the selection of a task inventory and task analysis by phase of system, equipment, or facility development so that the guidelines are limited to minimum essential needs to preclude unnecessary and unreasonable program costs. Guidance for the selection of a task inventory and task analysis by the procuring activity is contained herein.

## B.2 APPLICABLE DOCUMENTS

### B.2.1 General

The document listed below is not necessarily the only documents referenced herein, but is needed to fully understand the information provided by this appendix.

### B.2.2 Government documents

B.2.2.1 Handbook. The following handbook forms a part of this appendix to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the latest issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto.

HANDBOOK

DEPARTMENT OF DEFENSE

MIL-HDBK-1908 - Definitions of Human Factors Terms

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

## B.3 DEFINITIONS

Terms are defined in accordance with MIL-HDBK-1908.

## B.4 GENERAL GUIDELINES

### B.4.1 General.

A task inventory and task analysis should be performed and documented to ensure effective human-machine and human-human interface design, to facilitate effective training program development and T&E, and to provide information for manning and workload studies. These activities should begin in the early stages of the design phase of system development and should be carried throughout system development and acquisition.

### B.4.2 Task inventory.

A task inventory should be prepared to list all the tasks that operator, maintainer, and support personnel are to perform. The task inventory should include a list of the tasks required to perform operator, maintainer, and support personnel functions, as well as a description of each task in behavioral terms. The tasks should be organized or grouped according to logical criteria such as purpose and function. The level of detail in the task inventory (e.g., duty, task, subtask, task element) should be as specified by the procuring activity using the tailoring recommendations herein.

B.4.3 Task analysis.

Critical tasks should be subjected to a task analysis. In addition, other tasks should be analyzed as specified by the procuring activity. A set of data relevant to each task (critical or other) should be collected and analyzed. For each critical task, the minimum data collected and analyzed should be:

- Equipment acted upon
- Consequence of the action
- Feedback information resulting from the action
- Criterion of task accomplishment
- Estimate of probability of error
- Estimate of the time to perform the task successfully
- Relation of the time and error rate associated with each critical task to the performance time and error rate for the overall system.

Additional task data to be collected and analyses to be performed by the contractor should be specified by the procuring activity using the tailoring recommendations herein.

B.4.4 Level of detail and accuracy.

The level of detail in the task inventory and task analysis may be dependent upon the phase of system development and the task analysis application. The level of detail may be less in the early stages of system development than in later stages because of the lack of information. As the system develops and hardware and software specifications become solidified, the level of detail should increase. A greater level of detail normally is required as the system develops and matures. When feasible, the lack of detail in the early stages can be offset by an Early Comparability Analysis in which systems, equipment, or facilities similar to those being developed are examined to determine useful task information. The procuring activity should specify the level of detail using the tailoring recommendations herein. As a system develops, the precision of the task inventory and task analysis will improve and become more reliable.

B.4.5 Continuity.

As a system develops, changes are made and aspects of previous task inventories and task analyses become obsolete. Thus, they should be updated periodically to remain current. Currency should be maintained in the task inventory and task analysis throughout system development and acquisition. A task inventory and task analysis should build on previous task inventories and task analyses, with necessary changes and updates. Thus, there should be a continuity across the task inventories and task analyses performed during system development and acquisition.

B.4.6 Data base.

A data base of task inventory and task analysis information should be maintained and updated throughout system development and acquisition. This data base activity should be developed and

updated as the contractor produces task inventory output and performs the task analysis. As information from these activities is produced through an iterative process, as stated in B.4.5, the data base should be updated in a continuous manner. For large or complex systems, the data base should be computerized. However, task inventory and task analysis data for simple systems may be adequately represented in printed or graphic form.

## B.5 SPECIFIC GUIDELINES

### B.5.1 Task inventory.

A task inventory should be prepared for the military system, equipment, or facility being acquired. This task inventory should consist of a list of all tasks that operators, maintainers, or support personnel must perform. Mission analyses, scenarios and conditions, and functional analyses should have been completed and documented prior to the task inventory and task analysis efforts. The task inventory is then developed by examining each system function allocated to personnel and determining what operator, maintainer, or support personnel tasks are involved in the completion of each system function. The inventory should be organized in terms of system functions, jobs, duties, tasks, subtasks, and task elements, as reflected in the task taxonomy given in B.5.1.1.3 through B.5.1.1.8. The task inventory is composed of task statements, each of which consists of (a) an action verb that identifies what is to be accomplished in the task, (b) an object that identifies what is to be acted upon in the task, and (c) qualifying phrases needed to distinguish the task from related or similar tasks. A task statement should exhibit the properties of clarity, completeness, conciseness, and relevance. Clarity is enhanced when easily understood wording is used, when the task statement is precise enough that it means the same thing to all intended users, and when vague statements of activities, skill, knowledge, or responsibility are avoided. A complete task statement contains sufficient detail to meet the needs of all intended users of such data. Concise task statements are brief, begin with an action verb (the subject I or you is understood), and employ commonly used and well understood terminology, abbreviations, and acronyms. Finally, a relevant task statement contains only information germane to describing the task (not the qualifications of the operator, maintainer, or support personnel; necessary tools or job aids; etc.).

B.5.1.1 Task inventory taxonomy. The task inventory and subsequent task analysis should be developed for the operator, maintainer, and support personnel involved with the system hardware, equipment, or facility under development. The level of detail in the task inventory should be specified by the procuring activity. The required level of detail should be specified in terms of the following taxonomy:

B.5.1.1.1 Mission. What the system is supposed to accomplish, for example, combat reconnaissance.

B.5.1.1.2 Scenarios and conditions. Categories of factors for constraints under which the system will be expected to operate and be maintained, for example, day and night, all weather, all terrain operation.

B.5.1.1.3 Function. A broad category of activity performed by a system, for example, transportation.

B.5.1.1.4 Job. The combination of all human performance required for operation and maintenance of one personnel position in a system, for example, driver.

B.5.1.1.5 Duty. A set of operationally related tasks within a job, for example, emergency repair.

B.5.1.1.6 Task. A composite of related activities (perceptions, decisions, and responses) performed for an immediate purpose, for example, change a tire.

B.5.1.1.7 Subtask. Activities (perceptions, decisions, and responses) that fulfill a portion of the immediate purpose within a task, for example, remove lug nuts.

B.5.1.1.8 Task element. The smallest logically and reasonably definable unit of behavior required in completing a task or subtask, for example, apply counterclockwise torque to lug nut with lug wrench.

In addition to the task taxonomy given above, a consistent verb taxonomy should be used in the task statements. All verbs should be unambiguously defined within the taxonomy and used consistently throughout the task inventory. Some systems, equipment, and facilities will be developed with job categories well defined from the start of the task analysis activity. In this case, the task inventory should be organized by jobs and duties within jobs. New systems, equipment, and facilities under development may not have identifiable job categories, especially early in system development. In this case, the task analysis activity will be driven by the system functional analysis. As the task inventory and task analysis activity progresses, job positions will be identified by logically related sequences of tasks (duties).

B.5.2 Task analysis.

The task analysis process is one by which tasks are described in terms of the perceptual, cognitive, and manual behavior required of an operator, maintainer, or support person; the skills and information required to complete the task; equipment requirements; the task setting; time and accuracy requirements; and the probable human errors and consequences of these errors. It is not always necessary or cost effective to analyze all tasks in the task inventory. However, critical tasks should always be subjected to a task analysis. Tasks in the task inventory that reflect possible unsafe practices or that show the potential for improvements in operating efficiency should also be analyzed further, with the approval of the procuring activity. Finally, the

procuring activity may require the contractor to analyze other tasks not covered in the above categories, for example, frequently performed tasks.

B.5.2.1 Specific task analysis parameters. The task analysis should contain information detailed enough to support ongoing HE, training, T&E, manning, or workload activities, as specified by the procuring activity. The analysis of a task may include, but is not limited to, the following:

a. Input parameters
   (1) Information required
   (2) Information available
   (3) Initiating cues
   (4) Data display format

b. Central processing parameters
   (1) Decision or evaluation processes
   (2) Decisions reached after evaluation
   (3) Job knowledge required
   (4) System knowledge required
   (5) Academic knowledge required
   (6) Significant memorization required

c. Response parameters
   (1) Actions taken
   (2) Body movements required by action taken
   (3) Workspace envelope required by actions taken
   (4) Workspace envelope available for actions taken
   (5) Physical skills required
   (6) Frequency or interval of actions
   (7) Tolerances of actions
   (8) Tools and job aids used
   (9) Support and test equipment
   (10) Power required
   (11) Spares or parts required
   (12) Adequacy of space support
   (13) Controls used
   (14) Control location
   (15) Instrumentation, displays, and signals used
   (16) Instrumentation, display, and signal location

d. Feedback parameters
   (1) Feedback required
   (2) Feedback available
   (3) Cues indicating task completion
   (4) Rate of feedback update
   (5) Format of feedback

e. Environmental parameters
   (1) Workspace available
   (2) Workspace envelope required
   (3) Workplace arrangement
   (4) Environment contamination level
   (5) Climate
   (6) Noise
   (7) Shock, vibration, motion
   (8) Lighting
   (9) Workspace accessibility
   (10) Workplace accessibility
   (11) Life support and protective gear

f. Safety parameters
   (1) Types and locations of safety hazards
   (2) Cause of safety hazard
   (3) Frequency of safety hazard
   (4) Consequences of safety hazard
   (5) Safety procedures
   (6) Recommendation to eliminate or minimize safety hazard

g. Health parameters
   (1) Mechanical forces
      (a) Impulse noise and blast overpressure
      (b) Steady-state noise
      (c) Ultrasound
      (d) Vibration and motion
      (e) Acceleration and deceleration
      (f) Impact, shock, and recoil
      (g) Windblast
      (h) Pressure fluctuations
      (i) Weight and force loadings
   (2) Temperature extremes
      (a) Ambient and radiant heat
      (b) Surface heat
      (c) Flame and fire
      (d) Ambient cold

(e) Surface cold

(3) Electromagnetic radiation
   (a) Laser radiation
   (b) Microwave and radio-frequency radiation
   (c) Ultraviolet radiation
   (d) Intense visible light
   (e) Ionizing radiation
   (f) Particle beams
   (g) Magnetic fields

(4) Toxic substances
   (a) Fumes, vapors, and aerosols
   (b) Smoke
   (c) Liquids
   (d) Solids
   (e) Dust and particulates
   (f) Chemical warfare agents, biological warfare agents, and antidotes

(5) Psychological stress
   (a) Confined spaces
   (b) Isolation
   (c) Sensory and cognitive overload
   (d) Visual illusions and disturbances
   (e) Bodily disorientation (vestibular and kinesthetic)
   (f) Sustained high-intensity operations

(6) Other
   (a) Caustic chemicals
   (b) Oxygen deficiencies (airborne and terrestrial)
   (c) Restricted nutrition
   (d) Restricted water availability
   (e) Excessive water, moisture, or humidity
   (f) Human waste elimination constraints
   (g) Pests (insects and rodents)
   (h) Broken glass, shrapnel, and missiles
   (i) Skin or eye contact
   (j) Electric shock
   (k) Bacteria, viruses, and fungi

h. Performance standards and workload parameters
   (1) Accuracy requirements
   (2) Consequences of errors
   (3) Subjective assessment by operator, maintainer, or support personnel of the reasons for their errors
   (4) Description of each possible human-initiated error
   (5) Performance under stress
   (6) Subjective assessment of task workload

(7) Subjective assessment of equipment design adequacy for task performance
(8) Subjective assessment of sufficiency of training and experience for task performance
(9) Physiological workload assessment
(10) Cognitive workload assessment
(11) Criteria for successful performance
(12) Error sources
(13) Allocated elapsed time or time budget
(14) Allocated work hours
(15) Predicted elapsed time
(16) Predicted work hours
(17) Task schedule or time line
(18) Elapsed time required to accomplish the task

i. Social and organizational parameters
(1) Task interdependence of crewmembers
(2) Number of personnel required to perform task
(3) Specialty and experience requirements
(4) Division of labor or responsibility
(5) Communications employed

j. Housekeeping parameters
(1) Task, subtask, task element title or statement
(2) Task, subtask, task element number
(3) Methodology used to generate task analysis results
(4) Data sources used
(5) Date
(6) Name of task analyst
(7) System mission and function
(8) Position title and duty (of position being analyzed)
(9) Position or skill specialty code (MOS/AFSC/NEC)
(10) Activities preceding the task
(11) Concurrent tasks
(12) Additional comments
(13) Validation and quality control (especially of critical tasks)

k. Other parameters (not listed above)

B.5.2.2 Graphic representation of task analysis. The task analysis should be presented in narrative form and may be supplemented by graphic portrayal. In graphic form, the task analysis can be represented in a time-line chart, operational sequence diagram, flow chart, or other appropriate graphics. Time-line charts indicate the interrelationships among tasks as a function of time. Operational sequence diagrams depict the activities of human and machine systems components and the interrelations among these components over time. Flow charts represent the

functional dependencies among tasks. The principal advantage of the graphic format is that the sequential and simultaneous relationships among tasks are evident. Each task represented in the graphic form should be keyed to the narrative form of the task analysis. (See Section 8.3 for task analysis methods.)

B.5.3 Level of detail and precision.

The level of detail and precision used in the task analysis is determined by (a) the current phase of system development, and (b) the specifications of the procuring activity. The analysis may follow the system development cycle in a hierarchical fashion, so that tasks are defined early in system development, and then subtasks and task elements are described later in system development. The level of description ultimately used in the task analysis should be that level sufficient to meet the most detailed requirements specified by the procuring activity.

B.5.4 Continuity.

Task analysis activities should be carried on to remain current with the design effort during each phase of system development. The application of task analysis is to be considered iterative and evolutionary. To facilitate an orderly transition between system development phases, continuity among task analysis efforts should be ensured by (1) moving from the general to the specific as system development permits; (2) maintaining consistent and clearly defined terminology applicable to the system, equipment, or facility; (3) providing sufficient detail, relative to the phase of system development, to meet the most stringent information needs of a particular application; and (4) building upon previous task analysis efforts rather than starting anew each time the system undergoes some modification.

B.5.5 Data base requirements.

To be useful for the purposes intended by the procuring activity, a task inventory and task analysis data base should exhibit the following attributes:

B.5.5.1 Traceability. Data base inputs should be traceable. To provide accountability, the contractor should document the task analysis effort from the initial identification of functions, jobs, duties, tasks, subtasks, and task elements pertinent to system or job functions through the task analysis of tasks.

B.5.5.2 Data base media. For large, complex systems, task inventory and task analysis data should reside in a computer. However, for relatively simple systems, printed forms, supplemented with graphic materials, will suffice.

B.5.5.3 Accommodation of expansion and updating. The data base media should accommodate expansion and updating.

B.5.5.4 Relevance. The data base should not contain irrelevant data.

## B.6 ADDITIONAL SOURCES OF INFORMATION

Balcom, J., Mannie, T., Jr., et al. (September, 1982). Estimating the manpower, personnel, and training requirements of the Army's Corps Support Weapon System using the HARDMAN methodology (Technical Report No. 564). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD-A134037)

Berson, B., & Crooks, W. (September, 1976). Guide for obtaining and analyzing human performance data in a materiel development project (Technical Memorandum No. 29-76). Aberdeen Proving Grounds, MD: U.S. Army Human Engineering Laboratory. (AD-A071196)

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# APPENDIX C
# HE DATA ITEM DESCRIPTIONS (DIDS)

HE Data Item Descriptions (DIDs) are presented on the following pages in this order:

HE Simulation Concept (HESC) (DI-HFAC-80742B)
HE Test Plan (HETP) (DI-HFAC-80743B)
HE Test Report (HETR) (DI-HFAC-80744B)
HE System Analysis Report (HESAR) (DI-HFAC-80745B)
HE Design Approach Document-Operator (HEDAD-O) (DI-HFAC-80746B)
HE Design Approach Document-Maintainer (HEDAD-M) (DI-HFAC-80747B)
Critical Task Analysis Report (CTAR) (DI-DI-HFAC-81399A)

(Note: When this handbook was prepared, the Army Materiel Command, OPR for DI-HFAC-80742 through DI HFAC-80747, approved those DIDs only through January 1999. Those HE DIDs, not transferred to Navy or Air Force OPR(s) by that time will be cancelled. Accordingly, the latest issue of DOD 5010.12-L should be consulted to identify current human engineering DIDs.)

| DATA ITEM DESCRIPTION | *Form Approved OMB No. 0704-0188* |
|---|---|



| 1.TITLE | 2. IDENTIFICATION NUMBER |
|---|---|
| Human Engineering Progress Report | DI-HFAC-80741B |

3. DESCRIPTION/PURPOSE

The Human Engineering Progress Report describes the status of the contractor's human engineering program and reports progress, problems, and plans for each succeeding reporting period. These reports provide evidence that human engineering considerations are reflected in system design and development and indicate compliance with contractual requirements for human engineering.

a. This data item description (DID) contains the format and content preparation instructions for a Human Engineering Progress Report resulting from applicable tasks delineated in the SOW.

b. This DID supersedes DI-HFAC-80741A.

| 4. APPROVAL DATE *(YYMMDD)* | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. DTIC APPLICABLE | 6b. GIDEP APPLICABLE |
|---|---|---|---|
| Draft | A/AMCOM | | |

7. APPLICATION/INTERRELATIONSHIP

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
|---|---|---|
| | | |

9. PREPARATION INSTRUCTIONS

Requirements:

1. General. The Human Engineering Progress Report shall describe progress and activity in sufficient detail to demonstrate that human engineering considerations are reflected in systems analyses (or systems engineering analyses where required), system design and development, and system test and evaluation. Progress reports shall be concise and shall not unnecessarily repeat previously reported material. Changes may be indicated by reference to past reports rather than by duplication of an entire set of data, information, or plans. Where detailed data are furnished by other reporting media, they shall be referenced by, rather than included in the progress report; however, general summary information, reflecting results of efforts germane to reported progress, shall be included.

2. Format. The Human Engineering Progress Report format shall include the following separate sections:

a. Work accomplished this reporting period. This section shall address tasks begun, completed, or in progress; significant results of completed tasks; end item products completed and available for review; and unusual conclusions that may portend modification to future activities.

b. Work planned for next reporting period. This section shall address tasks that shall be started or completed.

10. DISTRIBUTION STATEMENT

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FIGURE C-1. HE progress report (HEPR) (DI-HFAC-80741B).

DI-HFAC-80741B HE Progress Report (HEPR)

Continuation of 9.0 PREPARATION INSTRUCTIONS

c. Problems. This section shall identify specific problems that occurred during the reporting period or are anticipated to occur during the next reporting period. Effects of problems on other tasks, schedules, costs or program scope shall be indicated. Proposed solutions shall be presented.

d. Actions required of the procuring activity. This section shall identify special considerations or problems requiring procuring activity assistance.

e. Appendix. This section shall present reports, project notes, drawings, or other documentation required to ensure completeness of the progress report.

3. Content. The Human Engineering Progress Report shall contain the following:

a. Summary and current status of human engineering activity.

b. Summary and status of significant human engineering design recommendations and action teams.

c. Summary of human engineering participation in major technical/subsystem reviews, other design reviews, and program reviews.

d. Summary results of human engineering analyses, studies, experiments, mock-up evaluations, simulation activities, tests, and demonstrations.

e. Results of projects, which involved human engineering participation (e.g., trade-off studies).

f. Other documentation reflecting changes to system design which affect human system interface (appended to the report as needed).

4. End of DI-HFAC-80741B

| DATA ITEM DESCRIPTION | *Form Approved OMB No. 0704-0188* |
|---|---|



| 1.TITLE | 2. IDENTIFICATION NUMBER |
|---|---|
| Human Engineering Simulation Concept | DI-HFAC-80742B |

3. DESCRIPTION/PURPOSE

The Human Engineering Simulation Concept describes the contractor's intended use of mockups and simulators in support of human engineering analysis, design support, and test and evaluation.

a. This data item description (DID) contains the format and content preparation instructions for the Human Engineering Simulation concept resulting from applicable tasks delineated in the SOW.

b. This DID is related to DI-HFAC-80741B, "Human Engineering Progress Report." This document may be used by the procuring activity to assist in and assess simulation approaches when there is a need to resolve potential critical human performance problems, particularly where government facilities, models, data or participants are required.

c. This DID supersedes DI-HFAC-80742A.

| 4. APPROVAL DATE *(YYMMDD)* | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. DTIC APPLICABLE | 6b. GIDEP APPLICABLE |
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| Draft | A/AMCOM | | |

7. APPLICATION/INTERRELATIONSHIP

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
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| | | |

9. PREPARATION INSTRUCTIONS

Requirements:

1. Format. The Human Engineering Simulation Concept format shall be contractor selected. Unless effective presentation would be degraded, the initially used format arrangement shall be used for all subsequent submissions.

2. Content. The Human Engineering Simulation Concept shall contain the following information:

a. Rationale and general description. The need for a mockup or simulation program shall be described. The overall simulation concept shall be described. Benefits to be derived shall be stated. The interrelationships between mockups, simulators, and other human engineering analysis, design support, and test and evaluation techniques shall be described.

b. Techniques. Each simulation technique and procedure proposed by the contractor shall be fully described. Rationale for the selection of techniques shall be given. The specific contributions of each technique to human engineering analysis, design support, and test and evaluation shall be stated. Previous efforts conducted by the contractor or others to validate each proposed technique shall be described, including a discussion of results.

10. DISTRIBUTION STATEMENT

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FIGURE C-2. HE simulation concept (HESC) (DI-HFAC-80742B).

Continuation of 9.0 PREPARATION INSTRUCTIONS

c. Intended use. The intended use of each simulation technique shall be described with regard to each of the following:

(1) Human performance and workload analysis, test, and demonstration.
(2) System design development, test, and demonstration.
(3) System effectiveness studies, tactics development, and verification.
(4) Development and verification of operator skill, knowledge, and other training data.
(5) Operator procedures development and verification, including degraded mode and emergency procedures.
(6) Training equipment design and verification studies.
(7) Development and verification of technical publications.

d. Schedule. A detailed schedule shall be identified. Compatibility between the simulation schedule and the release of program analyses, design, and test products for each area of utilization described in paragraph 2c. above, shall be described.

e. Facilities and special requirements. Simulation facilities shall be described. Any requirements to utilize government facilities, models, data, or other government property shall be identified. If the contractor requires participation by government personnel (e.g., as subjects in simulation studies), appropriate information shall be provided, such as number and qualifications of personnel, desired level of participation, and schedule of participation.

f. Scenarios and mission descriptions. The scenarios and missions to be simulated shall be described. Information on mission objectives, geography, threats, weather conditions, or any other data relevant to system simulation shall be presented.

3. End of DI-HFAC-80742B

DATA ITEM DESCRIPTION

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*OMB No. 0704-0188*



| 1.TITLE | 2. IDENTIFICATION NUMBER |
|---|---|
| Human Engineering Test Plan | DI-HFAC-80743B |

3. DESCRIPTION/PURPOSE

The Human Engineering Test Plan details the proposed testing to demonstrate that the personnel-equipment/software combination can accomplish the intended operation and maintenance functions in accordance with system specifications. This plan serves as the principal means of planning for validating human performance requirements, accuracy of personnel selection criteria, adequacy of training, and acceptability of design of the personnel-equipment/software interface.

a. This data item description (DID) contains the format and content preparation instructions for a Human Engineering Test Plan resulting from applicable tasks delineated in the SOW.

b. This DID is related to DI-HFAC-80744B, "Human Engineering Test Report". This plan serves as the principal means of planning for validating human performance requirements, accuracy of personnel selection criteria, adequacy of training, and acceptability of design of the personnel-equipment/software interface.

c. This DID supersedes DI-HFAC-80743A.

| 4. APPROVAL DATE *(YYMMDD)* | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. DTIC APPLICABLE | 6b. GIDEP APPLICABLE |
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7. APPLICATION/INTERRELATIONSHIP

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
|---|---|---|
| | | |

10. PREPARATION INSTRUCTIONS

Requirements:

1. General. The Human Engineering Test Plan shall detail the contractor's plan for gathering and analyzing data to show that the system, when fielded, will satisfy four criteria:

a. All human performance requirements for operations and maintenance can be performed to an acceptable level or standard under conditions of expected use.

b. The human performance requirements for operations and maintenance can be performed reliably by personnel reasonably representative of the military personnel who will ultimately perform them.

c. Both the cost (in terms of all resources required) and some measure (based on human performance time and error data) of prospective effectiveness of the contractor's training program for operations and maintenance are known.

d. The design of system hardware and software facilitates efficient, safe, and accurate human performance.

2. Format. The Human Engineering Test Plan format shall be contractor selected. Unless effective presentation would be degraded, the initially used format arrangement shall be used for all subsequent submissions.

10. DISTRIBUTION STATEMENT

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FIGURE C-3. HE test plan (HETP) (DI-HFAC-80743B).

DI-HFAC-80743B HE Test Plan (HETP)

Continuation of 9.0 PREPARATION INSTRUCTIONS

3. Content. The Human Engineering Test Plan shall contain the following:

a. Introductory information. Introductory information shall include the following:
(1) Title descriptive of each test to be conducted.
(2) Identification of equipment (or concept) being tested.
(3) Statement of the task groups (or portions thereof) being reported. (A list, in sequential order, of all the discrete performance tasks--with critical tasks identified--which will be required of each person in the system).
(4) Purpose of tests.
(5) Objective(s) of tests (if different from paragraph 3a-4).

b. Test design. Identification of test conditions, performance measures, sample sizes, and sequence of test events.

c. Test methods and controls. Description of procedures to be followed in conducting each test. Explanation of how environmental variables and other factors which could affect the performance measures will be controlled or described, including where relevant:
(1) Noise.
(2) Illumination level.
(3) Shock and vibration.
(4) Air temperature and humidity.
(5) Ventilation.
(6) Exposure to toxic or hazardous substances.

d. Test participants. General description of the personnel population from which test participants will be selected. Identification and justification of test participant selection criteria. Identification of methods by which data describing actual test participants will be gathered, including where relevant:
(1) Age.
(2) Weight.
(3) Sex.
(4) Body dimensions relevant to performance tasks.
(5) Visual acuity.
(6) Hearing level.
(7) Existence of physical disabilities.
(8) Educational and work experience.
(8) Prior experience relevant to performance tasks.

DI-HFAC-80743B HE Test Plan (HETP)

Continuation of 9.0 PREPARATION INSTRUCTIONS

e. Training of test participants.

(1) Type and amount (in hours) of system-specific pre-test training planned for test participants.
(2) Any end-of-training comprehension test administered to test participants before test data-gathering begins.

f. Equipment involved.

(1) Description of mockup or equipment on which tests will be conducted (including material to be used and type of fabrication, dimensions, and cross-reference to drawings or sketches).
(2) Identification of other, non-system equipment involved in tests (including all equipment to be worn, or carried or otherwise borne on the body of test participants such as weapon, communications equipment, headgear, survival equipment, protective mask and night vision equipment).

g. Data collection. Detailed description of the instrumentation or other means which will be used to obtain raw data on each of the performance measures. Identification of forms, if any, that will be used for recording data. Description of the frequency and means by which data on environmental variables and other extraneous factors will be collected.

h. Data reduction. Detailed descriptions of techniques to be used for transformation and combination of raw data, statistical techniques to be employed and assumptions pertaining to the use of each (e.g., normally distributed), and confidence levels selected.

i. Data analysis. Explanation of how the data collected will be used in:
(1) Human performance error analysis (e.g., “calculating operator error rate for mission-critical tasks”).
(2) Identifying incompatibilities among human performance and equipment.
(3) System safety analysis.
(4) Logistics and maintainability assessment(s).
(5) Calculating system reliability, availability, and effectiveness.

j. Test reporting. Identification of tests for which a “Human Engineering Test Report”, DI-HFAC-80744, is planned and tentative date(s) of initial submission.

4. End of DI-HFAC-80743B

**DATA ITEM DESCRIPTION**

*Form Approved*
*OMB No. 0704-0188*



| 1.TITLE | 2. IDENTIFICATION NUMBER |
|---|---|
| Human Engineering Test Report | DI-HFAC-80744B |

**3. DESCRIPTION/PURPOSE**

The Human Engineering Test Report provides evidence that the human-system interface requirements for the operation, maintenance, and support of the system have been met. This report serves as the principal means of assessing the compatibility of the human performance requirements, personnel selection criteria, training program, and design of the human-equipment/software interfaces. This report will be used to determine whether and to what level or standard(s) each trained individual can perform in the specified sequence all assigned systems tasks, to determine whether and to what extent each individual's performance is affected by equipment configuration, the performance of other system personnel, or both; and to assess the impact of the measured human performance on the attainment of task, task group, and mission requirements.

a. This data item description (DID) contains the format and content preparation instructions for a Human Engineering Test Report resulting from the work task delineated in the SOW.

b. This DID is related to DI-HFAC-80743A, "Human Engineering Test Plan".

c. This DID supersedes DI-HFAC-80744A.

| 4. APPROVAL DATE *(YYMMDD)* | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. DTIC APPLICABLE | 6b. GIDEP APPLICABLE |
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**7. APPLICATION/INTERRELATIONSHIP**

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
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| | | |

**10. PREPARATION INSTRUCTIONS**

Requirements:

1. General. The Human Engineering Test Report shall be prepared for each personnel position in the system being developed. All of the operations and maintenance tasks required of the individual assigned to a personnel position shall be referred to as the "task group" of the position.
2. Format. The Human Engineering Test Report format shall be contractor selected. Unless effective presentation would be degraded, the initially used format arrangement shall be used for all subsequent submissions.
3. Content. The Human Engineering Test Report shall contain the following:
   a. Introductory information.
      (1) Specific title of test.
      (2) Identification of equipment or concept being tested.
      (3) Specific purpose of this test.
      (4) Objectives of this test (if appropriate, stated in terms of hypothesis to be tested).
      (5) Date(s), location(s), names(s) of individuals present and supervising the conduct of the test.
      (6) For each task group or portion thereof reported, a list of all the discrete tasks and a brief description of the operational environment in which they are to be performed when the system is deployed.

**10. DISTRIBUTION STATEMENT**

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FIGURE C-4. HE test report (HETR) (DI-HFAC-80744B).

DI-HFAC-80744B HE Test Report (HETR)

Continuation of 9.0 PREPARATION INSTRUCTIONS

b. Description of test methods and controls. The following test methods and controls shall be described.

(1) Human performance standards. State or reference any human performance standards (e.g., "0.9 probability of operator launching missile within 10 seconds after detecting target") or assumed contribution to error (e.g., "aiming error less than 3 mils") contained in system development documents. If none, so state.

(2) Environment. Describe the environment at each distinct location of human performance. (Include noise and illumination levels, shock and vibration, air temperature and humidity, and ventilation. Also, state the concentration of, and test participant exposure time to any toxic or hazardous substances, and state whether that exposure was or was not within the applicable safety limits for each substance).

(3) Test participants. Describe test participants. For each participant, where relevant, state age, weight, body dimensions applicable to performance tasks, visual acuity and hearing levels, any known physical disabilities, and educational and work experience.

(4) Individual clothing and equipment. Describe individual clothing and equipment (including all clothing and equipment worn, carried or otherwise borne on the body, such weapon, communications equipment, headgear and protective mask).

(5) Pre-test training. Describe type and amount (in hours) of system-specific pre-test training (differentiating "hands on" practice from other training) given to test participants; and type, content and results of training used. Also, state time intervals between end of training, training assessment, and start of tests being reported.

(6) Mockup or equipment. Describe the mockup or equipment on which test is conducted (including material used and type of fabrication, dimensions, and cross-reference to blueprints, drawings or sketches).

(7) Deviations. Identify deviation(s) during the test from conditions of expected use (see paragraph 3a(6) above); narrative explanation of reason(s) for deviation(s), and presumed effect(s) of such deviation(s) on the validity of generalizations from test data.

c. Data collection and use. The following shall be identified or described, as indicated:

(1) Identification of the quantitative and qualitative measures of both human and system performance.

(2) Description of methods, procedures, and instrumentation used in data collection.

(3) Description of techniques used for data reduction, statistical techniques employed, and confidence levels selected.

DI-HFAC-80744B HE Test Report (HETR)

Continuation of 9.0 PREPARATION INSTRUCTIONS

d. Results. The following results shall be summarized:

(1) Quantitative human and system performance data.
(2) Qualitative data (including questionnaires, interviews, and checklists).

e. Human performance errors. The following considerations of human performance shall be described:

(1) Each error (narrative description, with photograph(s) if appropriate) and frequency of occurrence.
(2) Consequence (brief statement of the immediate effect of the error on system operation).
(3) Causes (isolation of the immediate cause of each actual performance error and identification of the events, conditions, operator workload, environmental factors, and equipment configurations which may have contributed to it).
(4) Explanation by participants making errors of the reasons for the errors.
(5) Recommended solutions (stated in terms of equipment redesign, alteration of tasks, personnel selection, training, or a combination of these) and rationale.

f. Incompatibilities among human performance and equipment.

(1) Identification. The following incompatibilities encountered during the test, shall be identified:

(a) The tasks of one task group that interfered with the performance of tasks of another task group. (Identify both the interfering and affected tasks.) If none, so state.
(b) The human performance that was adversely affected by equipment configuration or characteristics. (Identify the human performance, equipment involved, and controls or displays needed but not present.) If no adverse effects on human performance were encountered, so state.

(2) Recommend solutions. Recommend solutions (stated in terms of equipment redesign, alteration of tasks, personnel selection, and training). Provide rationale.

g. Observed safety hazards. Descriptions of each safety hazard encountered during the test shall include the information below. If none were encountered, so state.

(1) Narrative description, with photograph(s) if appropriate.

DI-HFAC-80744B HE Test Report (HETR)

Continuation of 9.0 PREPARATION INSTRUCTIONS

(2) Frequency of occurrence.
(3) Severity and consequences.
(4) Recommended action to eliminate or minimize hazard. (State in terms of equipment redesign, alteration of tasks, personnel selection, training, or a combination of these, and provide rationale).

h. Analysis of impact of human performance on attainment of system performance goals. This analysis shall include a:

(1) Statement of (or reference to) system performance goals.
(2) Narrative explanation of reasons why any human performance tasks required by present equipment design are not feasible, or why any standards presently set for specific performance tasks are unattainable. (if all human performance requirements are feasible and any standards set appear to have been met, so state).
(3) Narrative explanation of how measured human performance times and errors in operations and maintenance can affect system reliability and availability.
(4) Narrative explanation of how measured human performance times and error frequencies and magnitudes can affect system effectiveness.
(5) Narrative explanation of how system performance goals would be affected by implementing the solutions recommended in paragraphs, 3e, 3f, and 3g above.

i. Conclusions. Conclusions shall include:

(1) Summary of major findings from test,
(2) Implications of major findings (including anticipated effects on system reliability, availability, and effectiveness).

j. Recommended changes. List of recommended changes to equipment configuration, human performance tasks, personnel selection and training (in order of decreasing importance) with indication of government or contractor organization responsible for implementing recommended actions.

4. End of DI-HFAC-80744B

DATA ITEM DESCRIPTION

*Form Approved*
*OMB No. 0704-0188*



| 1.TITLE | 2. IDENTIFICATION NUMBER |
|---|---|
| Human Engineering System Analysis Report | DI-HFAC-80745B |

3. DESCRIPTION/PURPOSE

The Human Engineering System Analysis report describes the human engineering efforts conducted as part of system analysis and presents results. The data are used by the procuring activity to evaluate the appropriateness and feasibility of system functions and roles allocated to operators and maintainers.
a. This data item description (DID) contains the format and content preparation instructions for the Human Engineering System Analysis Report resulting from applicable tasks delineated in the SOW.
b. This DID supersedes DI-HFAC-80745A.

| 4. APPROVAL DATE *(YYMMDD)* | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. DTIC APPLICABLE | 6b. GIDEP APPLICABLE |
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| Draft | A/AMCOM | | |

7. APPLICATION/INTERRELATIONSHIP

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
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9. PREPARATION INSTRUCTIONS

Requirements:
1. Format. The Human Engineering System Analysis Report format shall be contractor selected. Unless effective presentation would be degraded, the initially used format arrangement shall be used for all subsequent submissions.
2. Content. The Human Engineering System Analysis Report shall contain the following:
a. System objective(s). In accordance with information provided by the procuring activity or contractor studies, the system objective(s) shall be described. If the objective(s) are to be met by the system operating in conjunction with other systems not within the scope of the contract, the following shall also be described.
(1) The overall (or higher level) objective(s) to be met through combined operation of systems.
(2) The sub-objective(s) to be met by the system being developed under the contract.
(3) Interactions required between systems to meet the objective(s).

b. System missions(s). In accordance with information provided by the procuring activity or based upon contractor studies, the system mission(s) shall be described. The mission description(s) shall describe the context(s) within which the system will meet its objective(s); e.g., geography, mission time constraints, weather, day/night, humidity, sea state, terrain roughness, vegetation density, enemy force concentration, enemy weapons/countermeasures capabilities, enemy order of battle, presence or absence of other cooperating systems.

10. DISTRIBUTION STATEMENT

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FIGURE C-5. HE system analysis report (HESAR) (DI-HFAC-80745B).

DI-HFAC-80745B HE System Analysis Report (HESAR)

Continuation of 9.0 PREPARATION INSTRUCTIONS

c. System functions. In accordance with information provided by the procuring activity or based on contractor studies, or both, the system functions (which must be performed to meet the system objective(s) within the mission context(s) shall be described.

d. Allocation of system functions. Allocation of system functions shall be described. Specifically, the following analyses and the results of these analyses shall be presented:

(1) Information flow and processing.
(2) Estimates of potential operator/maintainer processing capabilities.
(3) Allocation of functions.

e. Equipment identification. In accordance with information provided by the procuring activity and based upon contractor studies conducted to identify equipment, the selected design configuration shall be described.

3. End of DI-HFAC-80745B

DATA ITEM DESCRIPTION

*Form Approved*
*OMB No. 0704-0188*



| 1.TITLE | 2. IDENTIFICATION NUMBER |
|---|---|
| Human Engineering Design Approach Document-Operator | DI-HFAC-80746B |

3. DESCRIPTION/PURPOSE

The Human Engineering Design Approach Document - Operator (HEDAD-O) describes equipment which interfaces with operators. This document provides a source of data to evaluate the extent to which equipment having an interface with operators meets human performance requirements and human engineering criteria.
a. This data item description (DID) contains the format and content preparation instructions for HEDAD-O resulting from applicable tasks delineated in the SOW.
b. This DID supersedes DI-HFAC-80746A.

| 4. APPROVAL DATE *(YYMMDD)* | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. DTIC APPLICABLE | 6b. GIDEP APPLICABLE |
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7. APPLICATION/INTERRELATIONSHIP

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
|---|---|---|
| | | |

10. PREPARATION INSTRUCTIONS

Requirements:
1. Reference documents. The applicable issue of the documents cited herein, including their approval dates and dates of any applicable amendments, notices, and revisions shall be as cited in the current issue of the DODISS at the time of the solicitation.
2. General. The HEDAD-O shall describe the layout, detail design, and arrangement of crew station equipment having an operator interface; it shall also describe operator tasks (see below) associated with equipment. The HEDAD-O shall describe the extent to which human performance requirements and applicable human engineering design criteria (e.g., MIL-STD-1472) have been incorporated into the layout, design, and arrangement of equipment having an operator interface. Findings from analysis of operator tasks shall be presented as part of the rationale supporting the layout, design, and integration of crew station equipment.
3. Format. The HEDAD-O format shall be contractor selected. Unless effective presentation would be degraded, the initially used format arrangement shall be used for all subsequent submissions.
4. Content. The HEDAD-O shall contain the following crew station and operator-related information:
a. Equipment List. A list of each item of equipment having an operator interface and a brief statement of the purpose of each item of equipment. Separate lists shall be provided for each operator's station.

10. DISTRIBUTION STATEMENT

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FIGURE C-6. HE design approach document–operator (HEDAD-O) (DI-HFAC-80746B).

DI-HFAC-80746B HE Design Approach Document-Operator (HEDAD-O)

Continuation of 9.0 PREPARATION INSTRUCTIONS

b. Specification and drawing list. A list of specifications and drawings, approved by human engineering at the time of HEDAD-O preparation. When contractually required to prepare and submit the HEDAD-O early in the development process, the list shall also address documents where human engineering approval is planned.

c. Crew station description. Description(s) of the crew station(s), emphasizing human engineering design features. The following aspects of each crew station shall be described:

(1) Layout and arrangement. One sketch, drawing, or photograph of each crew station. These sketches, drawings, or photographs shall contain operator and equipment-related reference points (e.g., operator eye position, seat reference point) and scale. One sketch, drawing, or photograph of each item of crew station equipment shall also be provided; the point of reference shall be normal to the item of equipment and scale shall be indicated.

(2) Controls and displays. The layout and detail design of each control/display panel (or control/display areas independent of panels) shall be described (e.g., phospher type, brightness, resolution, contrast, color or other coding, control/display ratio, control force, and range characteristics). Display symbology, display formats, and control/display operation logic shall be described with regard to intended use by the operator(s).

(3) Operator vision. Operator vision to crew station items of equipment shall be described using the operator's normal eye position(s) as the point of reference. When applicable, operator external vision shall also be described using the operator's normal eye position(s) as the point of reference; extent of external vision shall be related to system mission requirements.

(4) Environmental factors. Operator life support systems, protective clothing and equipment, noise, vibration, radiation, temperature, ambient illumination, climatic effects, and other relevant environmental parameters.

(5) Ingress/egress. Normal and emergency ingress and egress provisions and procedures.

(6) Crew station lighting. Crew station lighting characteristics and lighting control systems.

DI-HFAC-80746B HE Design Approach Document-Operator (HEDAD-O)

Continuation of 9.0 PREPARATION INSTRUCTIONS

(7) Crew station signals. Crew station signals including warning, caution, and advisory signals shall be described with regard to signal characteristics, signal meaning, signal consequences, operator procedures, cause of signal activation, and crew control over signal characteristics.

(8) Operator posture control. Operator posture control including seating, restraint systems, and other postural control techniques.

(9) Communication systems. Communication systems and communication systems control.

(10) Special design. Special design, layout, or arrangement features if required by mission or system environment.

(11) Multiple operator stations. Multiple operator station design, shall be described where applicable. Rationale for number of operators, arrangement of operators, and allocation of functions to the operators shall also be described.

d. Crew station geometry. Crew station geometry shall be described using the seat reference point or operator's eye position(s) as a reference point. The position of each control, display, panel, etc., shall be described in terms of three-dimensional space (X,Y,Z coordinates); operator eye position shall be described in terms of system design coordinates or as zero (X), zero (Y), and zero (Z). The center of each panel, display, control, etc., shall be used as the equipment point of reference. True angle to vision to each item of equipment shall also be shown.

e. Human engineering design rationale. Rationale for human engineering design, layout, and arrangement of each item of crew station equipment having an operator interface shall be described. The specific considerations of system mission (or system function); equipment operation; operator selection, training, and skill requirements; operator task performance requirements; and limitations imposed on designs by the procuring activity or state-of-the-art shall be described. The basis for reaching specific design, layout, and arrangement decisions shall be presented (e.g., MIL-STD-1472 criteria, human engineering requirements or guidelines specified in the contract, system engineering analyses, systems analyses, human engineering studies, trade-off analyses, mock-up results, simulation results, and human engineering results).

DI-HFAC-80746B HE Design Approach Document-Operator (HEDAD-O)

Continuation of 9.0 PREPARATION INSTRUCTIONS

f. Analysis of operator tasks. Results from analysis of operator tasks (see critical tasks in MIL-HDBK-1908) shall be presented as part of the rationale for crew station design, integration, and layout. The following shall also be described: methodology used to generate task analysis results (e.g., paper and pencil, computer-based simulation, dynamic simulation); system-mission(s), function(s), or other exogenous information used to "drive" the task analysis; human performance data (e.g., time and error) against which task analysis results are compared; and operator assumptions (e.g., level of skill, training). Critical tasks (see MIL-HDBK-1908) shall be clearly identified. If the program has progressed to the point where the required data are available through other reporting media, such as a task inventory or task analysis, they shall not be duplicated, but shall be referenced or appended to the HEDAD-M along with appropriate supplementary information fulfilling the intent of this provision.

g. Alternatives to baseline design. Sketch, drawing, or photograph of each item of equipment being considered as alternatives or changes to the selected (baseline) crew station design.

h. Design changes. Design, arrangement, or layout changes made since the last HEDAD-O preparation.

5. End of DI-HFAC-80746B

**DATA ITEM DESCRIPTION**

*Form Approved*
*OMB No. 0704-0188*



| 1.TITLE | 2. IDENTIFICATION NUMBER |
|---|---|
| Human Engineering Design Approach Document-Maintainer | DI-HFAC-80747B |

**3. DESCRIPTION/PURPOSE**

The Human Engineering Design Approach Document-Maintainer (HEDAD-M) describes equipment which interface with maintainers. This document provides a source of data to evaluate the extent to which equipment having an interface with maintainers meets human performance requirements and human engineering criteria.

a. This data item description (DID) contains the format and content preparation instructions for HEDAD-M resulting from applicable tasks delineated by the SOW.

b. This DID supersedes DI-HFAC-80747A.

| 4. APPROVAL DATE *(YYMMDD)* | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. DTIC APPLICABLE | 6b. GIDEP APPLICABLE |
|---|---|---|---|
| Draft | A/AMCOM | | |

**7. APPLICATION/INTERRELATIONSHIP**

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
|---|---|---|
| | | |

**10. PREPARATION INSTRUCTIONS**

Requirements:

1. Reference documents. The applicable issue of the documents cited herein, including their approval dates and dates of any applicable amendments, notices, and revisions shall be as cited in the current issue of the DODISS at the time of the solicitation.

2. General. The HEDAD-M shall describe the characteristics, layout, and installation of all equipment having a maintainer interface (excluding depot level maintenance actions); it shall also describe maintainer tasks associated with the equipment. The HEDAD-M shall describe the extent to which the requirements and applicable human engineering design criteria (e.g., MIL-STD-1472) have been incorporated into the design, layout, and installation of equipment having a maintainer interface. Results from analysis of maintainer tasks shall be presented as part of the rationale supporting the layout, design, and installation of the equipment. The requirement for this information is predicated on the assumption that as analytic and study information, it is developed sufficiently early to influence the formulation of other system data, such as maintenance allocation, special repair parts, tool lists, and other logistic support data. If a task inventory or task analysis exists, it shall be referenced or appended to the HEDAD-M along with appropriate supplementary information fulfilling the intent of this provision.

**10. DISTRIBUTION STATEMENT**

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FIGURE C-7. HE design approach document–maintainer (HEDAD-M) (DI-HFAC-80747B).

DI-HFAC-80747B HE Design Approach Document-Maintainer (HEDAD-O)

Continuation of 9.0 PREPARATION INSTRUCTIONS

3. Format. The HEDAD-M format shall be contractor selected. Unless effective presentation would be degraded, the initially used format arrangement shall be used for all subsequent submissions. The HEDAD-M format shall present the information in two major parts:

a. Information pertaining to maintenance actions performed at the organizational level.
b. Information pertaining to maintenance actions performed at the Field/Intermediate Maintenance Activity (IMA) level.

4. Content. The HEDAD-M shall contain the following:

a. Equipment List. A list of each item of equipment having a maintainer interface at the organizational and Field/IMA level, and a brief statement of the purpose of each item of equipment and types of maintenance required on each item of equipment (e.g., troubleshoot, remove, inspect, test, repair.)
b. Specification and drawing list. A list of specifications and drawings, approved by human engineering at the time of HEDAD-M preparation. The list shall also address documents where human engineering approval is planned.
c. System equipment description. Description(s) of system equipment, emphasizing human engineering design features. The following aspects of each crew station shall be described.

(1) Layout and arrangement. The location and layout of all system equipment requiring maintenance with emphasis on human engineering features which facilitate maintenance. Equipment located in areas assessed through common doors, panels, openings, etc., shall be indicated. The location of each item of equipment shall also be noted in terms of three-dimensional space (e.g., X,Y, and Z coordinates); the reference point for each item of equipment shall be its center as viewed by the maintainer while gaining access to the equipment.
(2) Design of equipment. The design of each item of equipment with emphasis on human engineering features which facilitate maintenance, such as handles, self-test capability, labeling, connector spacing, and keying.
(3) Installation of equipment. The installation of each item of equipment with emphasis on human engineering features which facilitate maintenance such as fasteners, clearances, relationship between accessibility and failure rate (or scheduled maintenance frequency) of each item of equipment, and visual access afforded.

DI-HFAC-80747B HE Design Approach Document-Maintainer (HEDAD-O)

Continuation of 9.0 PREPARATION INSTRUCTIONS

d. Rationale. The specific consideration of equipment maintenance requirements (e.g., frequency, criticality, equipment failure rate), maintainer requirements (e.g., personnel selection, training, and skills), maintainer tasks requirements, environmental considerations, safety, and limitations imposed by the procuring activity or state-of-the-art. The basis for reaching specific design, layout, and installation decisions shall also be presented (e.g., MIL-STD-1472 criteria, human engineering requirements or guidelines specified in the contract, human engineering studies, trade-off analyses, mock-up results, and human engineering test results).

e. Special tools, support equipment, and aids. A list of special tools, support equipment, and job aids/devices required for maintenance of each item of equipment.

f. Analysis of maintainer tasks. Results from analysis of maintainer tasks (see critical tasks in MIL-HDBK-1908) shall be presented as part of the rationale supporting layout, design, and installation of items of equipment. Analysis of maintainer tasks analyses shall consist of the following: task number, task title, task frequency (for scheduled maintenance actions) or estimated task frequency (based on equipment mean-time-between-failure for unscheduled maintenance actions), data source used (e.g., drawing number, sketch number, development hardware, actual production equipment, detailed task sequence [see task analysis in MIL-HDBK-1908], support equipment required, tools required, job aids required, estimated task time, estimated personnel requirements [e.g., number of personnel required, skills and knowledge required] and human engineering considerations which reflect specific human engineering requirements incorporated into the design [e.g., maintainer fatigue, potential hazards, safety or protective clothing/equipment required or recommended, access problems, maintainer communication requirements, special task sequence requirements, labeling]). As applicable, the following types of maintainer tasks shall be addressed by the analyses of maintainer tasks; remove/replace, troubleshoot (fault location), repair, adjust, inspect, service, and test. Critical tasks (see MIL-HDBK-1908) shall be clearly identified.

g. Maintainer interface depictions. A sketch, drawing, or photograph of each item of equipment having a maintainer interface. Each item of equipment shall be depicted:

(a) by itself from top, front, and side (three-view trimetric or exploded trimetric view) and
(b) installed as the maintainer would normally view it during maintenance.

h. Alternative installations or layouts. A sketch, drawing, or photograph of each item of equipment being considered as an alternative to the selected, or baseline design. A sketch, drawing, or photograph of alternative equipment installations or layouts which exist at the time of HEDAD-M preparation shall also be provided.

DI-HFAC-80747B HE Design Approach Document-Maintainer (HEDAD-O)

Continuation of 9.0 PREPARATION INSTRUCTIONS

i. Design changes. Design, installation, or layout changes which have been made since the last HEDAD-M preparation, shall be described.

5. End of DI-HFAC-80747B

**DATA ITEM DESCRIPTION**

*Form Approved*
*OMB No. 0704-0188*



| 1.TITLE | 2. IDENTIFICATION NUMBER |
|---|---|
| Critical Task Analysis Report | DI-HFAC-81399A |

**3. DESCRIPTION/PURPOSE**

The Critical Task Analysis Report describes the results of analyses of critical tasks performed by the contractor to provide a basis for evaluation of the design of the system, equipment, or facility. The evaluation will verify that human engineering technical risks have been minimized and solutions are in hand.

a. This data item description (DID) contains the format and content preparation instructions for the data product generated by the specific and discrete task requirement as delineated in the contract.

b. This DID supersedes DI-HFAC-81399.

| 4. APPROVAL DATE *(YYMMDD)* | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. DTIC APPLICABLE | 6b. GIDEP APPLICABLE |
|---|---|---|---|
| Draft | A/AMCOM | | |

**7. APPLICATION/INTERRELATIONSHIP**

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
|---|---|---|
| | | |

**10. PREPARATION INSTRUCTIONS**

1. Format. The Critical Task Analysis Report format shall be contractor selected. Unless effective presentation would be degraded, the initially used format arrangement shall be used for all subsequent submissions.

2. Content. The Critical Task Analysis Report shall describe and analyze each critical task including:

a. Information required by and available to personnel which is relevant to the critical task assigned to them.

b. Actions which each performer shall complete to accomplish the critical task, including responses to specific information, responses to combinations of information, and self-initiated responses.

c. The functional consequences of each operator or maintainer critical task with respect to the effects upon both the immediate subsystem functions and the overall system mission.

d. All affected missions and phases including degraded modes of operation. Information on each critical task shall be provided to a level sufficient to identify operator and maintainer problem areas that can adversely affect mission accomplishment and to evaluate proposed corrective action.

**10. DISTRIBUTION STATEMENT**

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FIGURE C-8. Critical task analysis report (CTAR) (DI- DI-HFAC-81399A).

DI-HFAC-81399A Critical Task Analysis Report (CTAR)

Continuation of 9.0 PREPARATION INSTRUCTIONS

For each critical task, identify the:

(1) Information required by operator/maintainer, including cues for task initiation.
(2) Information available to operator/maintainer.
(3) Evaluation process.
(4) Decision reached after evaluation.
(5) Action Taken.
(6) Body movements required by action taken
(7) Workspace envelope required by action taken.
(8) Workspace available.
(9) Location and condition of the work environment.
(10) Frequency and tolerances of action.
(11) Time base.
(12) Feedback informing operator/maintainer of the adequacy of actions taken.
(13) Tools and equipment required.
(14) Number of personnel required, their specialties, and experience.
(15) Job aids, training, or references required.
(16) Communications required, including type of communication.
(17) Special hazards involved.
(18) Operator interaction where more than one crew member is involved.
(19) Performance limits of personnel.
(20) Operational limits of machine and software.

3. End of DI-HFAC-81399A